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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: LUCA D'OTTONE

Examiner: Jastrzab, Krisanne Marie

Serial No.: 09/683,445

Group Art Unit: 1744

Filed: December 31, 2001

For: STERILIZATION AND DETOXIFICATION OF CONFINED SPACES

The Commissioner of Patents
and Trademarks
Alexandria, VA 22313

DECLARATION UNDER 37 CFR 1.131

Luca D'Ottone, inventor of the subject matter claimed in the above-identified patent application, hereby makes the following declaration:

(1) Attached hereto is an article entitled "Ozone Based Environmental Sanitation Process," that I personally wrote which describes the invention claimed in the above-identified patent application. The article was signed by me before a notary public, Olga M. Davis, on November 8, 2001, and was notarized by that notary public on that date. Each page of the article was also signed by me at that time.

The declarant further states that the above statements were made with the knowledge that willful false statements and the like are punishable by fine and/or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that any such willful false statement may jeopardize the validity of this application or any patent resulting therefrom.

Date: September 19, 2005

By: _____
Luca D'Ottone

Ozone Based Environmental Sanitation Process

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1.0 Background

With the scare of the Anthrax a lot of opportunities for environmental cleaning and disinfection have opened. I developed the idea to apply a relatively new and inexpensive disinfection process, largely used in the food and water industry to the specific disinfection of closed and semi-closed environments and object that may not be autoclavable.

The disinfection effectiveness of the process is proven but the process itself has never been used to environmental disinfection, because in the past there have been no such need. Moreover I am not aware of any current literature study with specific interest in the destruction of Anthrax spores by exposure to gas phase molecular ozone.

2.0 Process Principles and Operations

2.1 Environmental Sanitation Process

The basic idea is to produce ozone with a commercial ozonizer from oxygen and/or air and pump it in a closed environment in sufficient amount to oxidize the organic/biologic material present in the room.

2.2 Object Sanitation Process

For the sanitation of objects that cannot be sterilized in an autoclave the idea is to close them in a cell, expose them to a negative pressure between 1 and 30 Torr, and to expose them to UV light under an ozone atmosphere. The variables of this process are:

1) Contact Time, (CT)
2) Temperature, (T)
3) Ozone Mixing Ratio (X) or concentration (C)
4) Intensity of the UV light (I)
5) Relative Humidity (RH).

An additional variable that could not be controlled would be the concentration and the form of the pollutant to be removed.

2.1 Difference with previous ozone based sanitizing techniques.

The principle of oxidizing biologic and organic material with ozone has been known for a long time. Several applications of ozone chemistry have been developed for the food and the water industry. Nevertheless the homogeneous gas-phase chemistry is still largely unexplored because the potential health-hazard for humans. In other words in the past the possibility to sanitize environment by ozonizing them has been considered only in the case of the environmental cleanup of post-fire sites. Otherwise the strict EPA limitations for workplace and the lack of need for a non-destructive gas-phase-sanitizing agent have limited the interest for ozone air purification. In all the embodiments of this patent the EPA limit for ozone concentrations in closed spaces are exceeded but at the same time the human presence in the environment that needs to be treated is avoided.

2.2 Details

Ozone is photolyzed into a chamber at relatively high humidity to produce hydroxyil and hydro-peroxyil radicals. In the photolosis of ozone, the UV light forms an excited state of ozone ($O(^1D)$) that reacts with water according to the equation: $O(^1D) + H_2O \rightarrow 2HO$. In addition to the production of the hydroxyl and hydro peroxyil radicals via photolysis, ozone alone also reacts directly with a hydrogen atom donor to form hydroxyl (and hydroperoxyl) free radicals. Because that reaction occurs even in the absence of UV light, hydroxyl free radicals can form by that reaction anywhere in the room. Ozone may also dissolve in water droplets and form hydroxyl (and hydroperoxyl) free radicals in the droplets, which are carried by the droplets throughout any enclosure.

The molar ratio of ozone to hydrogen atom donor should be about 1:1 to about 10:1 as at lower ratios the hydrogen donor would be in excess in the room and the process would require higher exposure times to be effective. At higher ratios, an excess of ozone would be available but not effectively employed. The preferred molar ratio of ozone to hydrogen atom donor is about 5:1 to about 10:1. Suitable hydrogen atom donors include water, ammonia, hydrogen gas, methane, and reduced sulfides. The preferred hydrogen atom donor is water because it is inexpensive, safe, and easy to use.

The reaction of ozone with water to form hydroxyl free radicals peaks at a wavelength shorter than 305 nm, so the UV light should have a wavelength of less than about 300 nm. The preferred wavelength is about 100 to about 300 nm and most preferably at about 253 nm because inexpensive commercial UV lamps produce light at that peaks at that wavelength. The conversion of ozone and water to hydroxyl free radicals from ozone and water is somewhat limited by the amount of UV radiation produced, but an intensity of a few μ-Joules per cm^2 per mole of ozone is usually sufficient; the preferred light intensity is about 1 m-Joule/cm^2 per mole of ozone and intensities between 1 μ-Joule and 1 Joule/cm^2 per mole of ozone may be used proficiently. The UV lamp that provides the light is preferably positioned so that the ozone and hydrogen atom donor mix and pass in front of the light as they enter the enclosure.

2.3 Advantages of Ozone/OH sanitizing process

1) Does not create toxic waste: in fact the excess of ozone decomposes back to molecular oxygen under atmospheric conditions.
2) Does not create persistent pollutants as chlorinated organic compounds
3) The products of the reaction between ozone and a variety of organics are mainly haldeydes that are quickly photolyzed and removed from the atmosphere.
4) Does not need a manual operator to physically clean the room
5) It is strongly penetrating
6) It is not a liquid based treatment and does not require contact of a solution with the object to be sanitized. Hence it is a non destructive sanitizing technique for all those materials that are not suitable for classical sterilization by autoclave.
7) It is not a destructive technique.

2.4 Downsides of Ozone/OH sanitizing treatment:

1) It affects dyes, rubber and plastic materials corroding them.

2) Since ozone in the wrong experimental condition may be explosive, the process needs to be operated by trained personnel.
3) Gas phase ozone chemistry is still largely unknown in the conditions proposed to be used in this study hence a final disinfection or sterilization process may still be required.

2.5 References

US Patent Document 6,294,211 and Patent herein quoted.
Dunston, N.C.; Spivak, S.M.; Journal of applied Fire Science. 6(3); 231-242.
Forade et al.; Applied Occupational Environmental Hygiene. 12(3); 535-542.
US-EPA 600/R-95-154
US-EPA PB-185582, PB96-185590 and PB96-185608
US-EPA 452/R-96-007.

3.0. Notarization. Have their signature notarized in the space below.

THIS SECTION IS FOR NOTARIZATION

PRINT SIGNATORY'S FULL LEGAL NAME: LUCA D'OTTONE

SIGNATURE: (as it will appear on documents) Luca D'Ottone

(NOTARY) I, OLGA M DAVIS **as a notary public certify under the pains and penalties of perjury that I witnessed the signature of the aforementioned signatory Luca D'Ottone , and the individual's identity was verified, on this date:** 8th of November, 2001.

My commission expires on:

Olga M. Davis

Olga M. Davis
MY COMMISSION # CC855444 EXPIRES
November 16, 2003.
BONDED THRU TROY FAIN INSURANCE, INC.